



# **Economic Growth Effects of the System Alternatives for the Program Environmental Impact Report/Environmental Impact Statement**

final  
report

*prepared for*

**California High-Speed Rail Authority**

*prepared by*

**Cambridge Systematics, Inc.**

*with*

**Economic Development Research Group, Inc.  
Michael Reilly**

*July 2003*

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Cambridge Systematics, Inc.  
555 12<sup>th</sup> Street, Suite 1600  
Oakland, California 94607

*July 2003*

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## **1.0 Executive Summary**

# 1.0 Executive Summary

## ■ 1.1 Introduction

This report presents an analysis of the potential economic development and growth effects for the system alternatives considered in the program-level environmental impact report (EIR)/environmental impact statement (EIS).<sup>1</sup> The intent of the analysis is to understand the extent of statewide, regional, and local growth effects in terms of population and employment change, and land consumption associated with these changes. This report:

- Identifies the potential statewide and interregional employment and population changes associated with each alternative;
- Identifies the urban area size needed to accommodate population and employment growth;
- Identifies the potential for employment and population concentration in the vicinity of high-speed train (HST) stations; and
- Describes a range of potential positive and negative consequences related to growth and development, and potential strategies for managing these consequences under alternative statewide transportation strategies.

The report presents results for existing conditions (year 2002) and forecast years of 2020 and 2035. The 2020 forecast year provides for consistency with analyses being conducted in other resource areas, while the 2035 forecast year provides a longer-time horizon for full market response after completion of the HST or Modal Alternatives.

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<sup>1</sup> The system alternatives included No-Project (existing, programmed, and funded transportation facilities); Modal (No-Project plus additional highway and air improvements in many intercity corridors); and High-Speed Train (HST). The base HST alternative extended from San Francisco to San Diego via Pacheco Pass, downtown Central Valley stations, I-5/Grapevine, and the Inland Empire, with an additional extension to Sacramento via the Central Valley. Several HST design options were also analyzed, including a Diablo crossing (instead of Pacheco Pass), a Palmdale (instead of Grapevine) alignment, an additional East Bay alignment between San Jose and Oakland, an additional extension between Los Angeles Union Station and Irvine, and outlying stations in the Central Valley and San Diego.

## ■ 1.2 Economic Growth and Development Analysis

The potential economic growth stimulus of a transportation investment may be measured not only in terms of its *overall magnitude*, but also in terms of its *relative distribution* among different geographic areas. In economic terms, this distinction is the “generative” versus “distributive” dimensions of growth. Transportation investments, such as airports, highways, transit, and high-speed train, comprise just one of many factors that determine how much growth will occur and whether it will be generative versus distributive in nature. Other major growth factors, such as education level, housing affordability, land availability, and others, interact in complex and sometimes unpredictable ways for communities, regions, and entire states. Public and private policy tools, such as land use planning and zoning, enterprise development zones, and infrastructure funding, can also influence both the magnitude and the distribution of economic growth.

The results presented in this report were developed in a multi-phased process that combined the Regional Economic Models, Inc. (REMI)<sup>2</sup> macroeconomic simulation model, with a business attraction model, an employment allocation routine, and a residential spatial allocation model. The process considered the effects that changes in transportation congestion and delay between existing conditions and future years would have on the State’s economic growth. The process also modeled several dimensions of growth and spatial reallocation that could occur with any of the system alternatives, and considered many possible impacts of high-speed train and modal investments on jobs, population, and land development, including the following:

- Increased employment because of attraction of new businesses to California, or expansion by businesses already located in the State;
- Reallocation of employment because of changes in business location by firms already located in California;
- Population growth associated with business attraction, expansion, and spatial shift;
- Shift in residential population between counties (with fixed employment location) due to changed accessibility for the Modal and HST Alternatives (i.e., long-distance commutes);
- Shift in employment for retail and personal service establishments that follow shifts in residential location;

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<sup>2</sup> The REMI model is a regional economic analysis model that can be used to estimate the macroeconomic impacts of policies or investments that change some aspect of the business climate in the region. It is the most widely used and accepted economic impact tool in the country, with unique capabilities for transportation analyses.

- Changes in densification and development patterns over time both with and without the presence of a HST station;
- Allocation of population and employment between currently developed and undeveloped areas within each county; and
- Consumption of undeveloped or “raw” land to house projected population and employment growth.

## ■ 1.3 Statewide and Regional Growth Effects

Statewide population is expected to grow by about 54 percent between 2002 and 2035 (Table 1.1). Compared to the No-Project Alternative, the population growth is roughly one percent higher for the Modal Alternative and two percent higher for the HST Alternative. These population differences between alternatives represent the increased accessibility provided by the transportation investments; hence, an HST investment would lead to greater economic growth within the State than the Modal or No-Project Alternatives. These statewide figures follow the same general pattern at the regional level, with the exception of the North Central Valley where population growth is about four percent higher for the HST Alternative than the other two system alternatives.

The HST population growth rate represents a statewide increase of 700,000 people over the No-Project, and 340,000 people over the Modal Alternative. However, the greatest population increase is between 2002 existing conditions and the 2035 No-Project Alternative, with relatively small increases in population growth occurring between system alternatives in the year 2035.

**Table 1.1 Projected Population Growth Rate by Region**

Area	Year 2002 Population (Millions)	Growth Rate (Year 2002 to 2035)		
		No-Project Alternative	Modal Alternative	HST “Base” Alternative
Bay Area	6.3	28%	29%	30%
North Central Valley	2.9	77%	78%	81%
South Central Valley	2.1	87%	88%	89%
Southern California	19.5	53%	54%	55%
Rest of California	5.1	66%	66%	67%
<b>Statewide Total</b>	<b>35.8</b>	<b>54%</b>	<b>55%</b>	<b>56%</b>

Source: Cambridge Systematics, Inc., 2003.

Statewide and regional employment growth rates are generally similar to the population growth rates, although employment growth for the HST Alternative in the Central Valley regions, especially the Northern Central Valley, exhibits a stronger difference from the other alternatives than population growth. (Table 1.2). Statewide employment is projected to increase by 46 percent under the No-Project Alternative, with an additional increase of one percent for the Modal Alternative and two percent for the HST Alternative. The HST employment growth rate represents a statewide increase of about 450,000 jobs over the No-Project, and 200,000 jobs over the Modal Alternative. As with population growth, however, this level of difference between the alternatives is very small compared to the overall level of growth represented by the No-Project Alternative relative to the 2002 existing conditions.

These modest statewide differences, however, conceal more substantial differences that are revealed by comparing some key differences at the regional level:<sup>3</sup>

- Compared to the Modal Alternative, the HST Alternative exhibits higher employment growth rates in all regions and all counties except Riverside. Results are similar for population, where the HST Alternative exhibits higher growth rates in all regions and all counties, except Orange, Riverside, and San Joaquin.
- Merced County exhibits the largest relative increase in both population and employment for the HST Alternative, adding about 10,000 jobs and 28,000 people on a base of 165,000 jobs and 421,000 people in the 2035 No-Project Alternative. Population and employment growth are also relatively strong in the other Central Valley counties between Sacramento and Fresno, although relative employment growth is larger than relative population growth.

**Table 1.2 Projected Employment Growth Rate by Region**

Area	Year 2002 Employment (Millions)	Growth Rate (Year 2002 to 2035)		
		No-Project Alternative	Modal Alternative	HST "Base" Alternative
Bay Area	4.1	36%	37%	39%
North Central Valley	1.5	60%	62%	67%
South Central Valley	1.0	56%	57%	59%
Southern California	10.5	48%	50%	50%
Rest of California	2.7	40%	39%	40%
<b>Statewide Total</b>	<b>19.8</b>	<b>46%</b>	<b>47%</b>	<b>48%</b>

Source: Cambridge Systematics, Inc., 2003.

<sup>3</sup> Regional results for the No-Project and HST Alternatives are expressed relative to the No-Project Alternative, unless noted otherwise.

- San Joaquin County exhibits the largest relative increase in employment for the Modal Alternative (adding about 15,000 jobs on a base of 500,000), while San Francisco County exhibits the largest relative increase in population (adding about 11,000 residents on a base of 705,000). San Diego, Orange, and Fresno Counties also exhibit higher employment growth rates than other counties, while population growth rates tend to be fairly even for remaining counties.
- Model results suggest that the additional population growth in the HST Alternative is driven by internal job growth related to initiation of HST service, rather than population shifts from the Bay Area and Southern California with commensurate long-distance commuting. Model results suggest a stronger propensity for redistribution of population *within* the Central Valley, with long-distance commuters relocating from Sacramento and San Joaquin Counties to lower cost and better positioned (for HST service) housing in areas such as Merced and Stanislaus Counties.
- For the rest of California, the HST Alternative exhibits a small, yet positive growth rate for both population and employment, while the Modal Alternative is projected to decrease both population and employment. Results for the Modal Alternative are affected, in part, by increased taxation and user fees that might be needed to fund the higher initial capital costs of this alternative; these higher taxes and fees result in a slight reduction in economic growth, and hence population and employment, than would occur if no additional taxation or fees were required.

The Modal and HST Alternatives exhibit noticeable differences in the types of jobs that are attracted to different regions. Table 1.3 depicts the percent of growth by major industry group for the increment of jobs that are “induced” by these two alternatives (i.e., job growth above and beyond the No-Project Alternative). The HST Alternative exhibits a tendency to attract a higher proportion of jobs in the services, government, and finance, insurance and real estate (FIRE) sectors, while the Modal Alternative is relatively stronger in transportation, communications and utilities (TCU), wholesale and retail trade, and construction and manufacturing. The strongest employment sectors for the HST Alternative tend to be the most compatible for location in higher density settings, such as near potential HST sites. On the other hand, the employment sectors dominated by the Modal Alternative tend to be associated with less dense development settings such as currently found on the fringe of California’s urban areas.

The modeling process was also used to look at systemwide growth sensitivity for the HST design options. County-level growth projections were nearly identical between the base HST Alternative and the different design options. One exception involved the Irvine design option, for which Orange County could gain about 5,000 jobs (0.2 percent) and 9,000 residents compared to the base HST Alternative. Nonetheless, in nearly all cases the magnitude of difference between the HST design options was less than the difference between the system alternatives.

**Table 1.3 Percent of Incremental Growth by Industry**

		Incremental Growth Rate (Year 2035)				
		Farming and Mining	Construction and Manufacturing	TCU and Trade	FIRE and Services	Govern- ment
Bay Area	Modal	0%	15%	34%	44%	7%
	HST	0%	16%	30%	46%	8%
North Central Valley	Modal	0%	14%	31%	44%	11%
	HST	0%	9%	19%	64%	9%
South Central Valley	Modal	1%	17%	23%	48%	12%
	HST	1%	14%	21%	51%	13%
Southern California	Modal	0%	17%	31%	43%	8%
	HST	0%	18%	30%	44%	9%
<b>Statewide Total</b>	<b>Modal</b>	<b>0%</b>	<b>16%</b>	<b>31%</b>	<b>44%</b>	<b>9%</b>
	<b>HST</b>	<b>0%</b>	<b>15%</b>	<b>27%</b>	<b>48%</b>	<b>10%</b>

Source: Cambridge Systematics, Inc., 2003.

## ■ 1.4 Local Growth and Land Consumption

Urbanized areas in California are expected to grow by 47 percent between now and 2035 under the No-Project Alternative, as shown in Table 1.4. This rate represents an increase of about 1.5 million acres from today's 3.1 million acres within the "influence area"<sup>4</sup> of the study. Urbanized area growth is expected to be about 1.4 percent (65,000 acres) higher for the Modal Alternative and 0.01 percent (3,000 acres) less for the HST Alternative. As with the population and employment growth, the level of difference between alternatives for urbanized area size is very small when compared to the overall level of growth represented by the No-Project Alternative relative to the 2002 existing conditions. Nonetheless, the results indicate that the HST Alternative is able to accommodate more population and employment growth on less land than the other system alternatives.

In general, HST station areas will establish a relatively stronger market for commercial and office development than the No-Project and Modal Alternatives. Research conducted for this project of urban rail systems in North America and the high-speed rail systems in Europe and Asia supports this conclusion. This research found that industries needing large numbers of highly skilled and specialized employees are most attracted to rail

<sup>4</sup> The "influence area" for the study includes counties that have a high-speed rail station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

station area development, and that a noticeable densification pattern is likely to emerge in the vicinity of many HST stations under regular real estate market forces.

**Table 1.4 Increase in Urbanized Area Size by Region**

Area	Year 2002 Urbanized Area Acreage (Thousands)	Percent Increase (Year 2002 to 2035)		
		No-Project Alternative	Modal Alternative	HST "Base" Alternative
Bay Area	617	22%	22%	23%
North Central Valley	368	57%	58%	56%
South Central Valley	287	92%	93%	95%
Southern California	1,871	48%	51%	47%
<b>Influence Area Total</b>	<b>3,143</b>	<b>48%</b>	<b>50%</b>	<b>48%</b>

Source: Cambridge Systematics, Inc., 2003.

In fact, the research and analysis indicates that the considerably stronger draw of an HST station, when compared to a conventional intercity rail station or freeway interchanges, provides a potent tool for encouraging more compact development patterns. These development patterns would likely offer many businesses a competitive advantage within their industry, because of close proximity to ancillary industries (i.e., industry clustering) and a well-educated labor force. These advantages, known as *economies of agglomeration*, have emerged around the French and Japanese HST stations, and are accepted norms for land use planning for many urban transit station areas in Europe and North America.

The research also found that regulatory-style efforts by cities to encourage increased density and a mix of land uses near rail stations have been effective in creating even denser developments. A Central Valley city, for example, would have an easier time redirecting new development to downtown sites adjacent to their HST station than the outlying real estate markets created by freeway interchanges under the No-Project and Modal Alternatives. Furthermore, the strong markets around HST stations are likely to attract development that would otherwise locate throughout a dispersed suburban region. Thus, development around HST stations will consist of both consolidation of currently projected growth (under the No-Project Alternative) and new regional employment and population associated with the HST Alternative.

The potential effect of regulatory-style land use strategies was tested in this analysis. Results suggest that even a modest strategy focused on the immediate station areas could reduce the urbanized area size by an additional 30,000 acres for the HST Alternative. These results represent a low-end estimate of the possible densification effects of regulatory strategies in combination with the introduction of HST service. The research suggests

that other jurisdictions have had some success in implementing more aggressive and regionwide regulatory-style strategies<sup>5</sup> in conjunction with high-capacity intercity and urban transit services. Experience in these areas suggests that more aggressive strategies might be more attractive to policy makers since HST could offer the economic rationale to developers to cluster their new commercial, industrial, and residential development within easy access to the HST stations. In general, the No-Project and Modal Alternatives provide no such market incentive.

The analysis also suggested that the most of the design options would not create meaningful differences in overall urban area size or these station-area effects.<sup>6</sup> The one exception is the Outlying Stations design option, in which the location of Central Valley and San Diego HST stations outside of the downtown area would likely weaken the *economies of agglomeration* for businesses within these communities. In particular, a San Diego terminus at East Mission Valley instead of Downtown San Diego is projected to increase countywide land consumption by about 12,000 acres (0.5 percent) relative to the base HST Alternative. The analysis suggest an advantage, both in terms of potential HST ridership inducement and growth control, with locating HST stations in or near the downtown areas as opposed to suburban or undeveloped areas.

## ■ 1.5 Significance of Findings

Overall, the system alternatives and HST design options represent very similar levels of growth effects in terms of urbanized area size and land consumption needs. The incremental effect of the Modal and HST Alternatives relative to the No-Project Alternative is very small when compared to the incremental effect of the No-Project Alternative relative to 2002 existing conditions.

Analysis of results for individual counties largely follows these general statewide results. Nonetheless, the HST Alternative does create some larger incremental growth relative to the other system alternatives in some Central Valley counties between Sacramento and Fresno. However, in all cases except Sacramento County, the incremental employment effect is much larger than the incremental population effect, suggesting that the HST Alternative does a better job at distributing employment throughout the State. Also, this result suggests that HST will not lead to wholesale shifts in residential location from the Bay Area and Los Angeles into the Central Valley.

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<sup>5</sup> Examples include urban growth boundaries, maximum parking requirements, jobs housing balance, more diversity of land uses, higher densities, higher service levels of mass transit, etc.

<sup>6</sup> For the Palmdale design analysis, results suggest that the likely growth effect in the Antelope Valley (including stations in both Palmdale and Sylmar) is on the order of 25,000 people and 15,000 jobs relative to the No-Project Alternative, and 3,000 people and 1,000 jobs relative to the base HST Alternative.

Experiences in other countries have shown that an HST system can provide a location advantage to those areas that are in proximity to an HST station, while at the same time facilitating broader economic expansion for a much wider geographic region. HST's potential economic boost arises in two ways:

1. An HST system would provide user benefits (travel time savings, cost reductions, accident reductions) and accessibility improvements for California's citizens; these user benefits can accrue not only to HST travelers, but also to travelers on other modes as trips are diverted from highways and airports resulting in reduced congestion.
2. HST would improve accessibility to labor and customer markets, thereby, improving the competitiveness of the State's industries and the overall economy. With this second effect, businesses that locate in close proximity to an HST station can operate more efficiently than businesses that locate elsewhere. Experience from overseas suggests that this competitive advantage is quite pronounced in high-wage employment sectors that are frequently in high demand in many communities. This second effect is much stronger for the HST Alternative than the other system alternatives.

One of the most telling summary statistics is to combine population and employment growth projections with land consumption forecasts, providing a measure of "land consumed per new job and resident." Essentially, this metric tells us how "efficient" each alternative is at accommodating the projected growth; since the system alternatives have very similar levels of overall growth, the efficiency by which that growth is accommodated becomes very important. Table 1.5 provides the relevant data and resulting metric for each of the system alternatives; lower values of the metric suggest greater efficiency. The results indicate that the HST Alternative is the most "efficient" of the system alternatives providing an incremental development density that is 4.0 percent more "efficient" than the No-Project Alternative, while the Modal Alternative is 2.3 percent less efficient than the HST Alternative. This efficiency for the HST Alternative is achieved in conjunction with the highest population and employment growth rates of all system alternatives.

**Table 1.5 Marginal Land Consumption**

	<b>No-Project Alternative</b>	<b>Modal Alternative</b>	<b>HST Alternative</b>
Land Consumption (thousands of acres)	1,505	1,570	1,501
Job Growth (000)	9,085	9,328	9,529
Population Growth (000)	19,408	19,771	20,099
Acres Consumed per New Job and Resident	0.0528	0.0540	0.0507
"Efficiency Gain" Relative to No-Project Alternative	-	-2.3%	+4.0%

Source: Cambridge Systematics, Inc., 2003.

## ■ 1.6 Conclusions

All three alternatives are associated with robust forecasts of population and employment growth throughout California. The alternatives are similar in terms of potential economic growth effects and land consumption. The major growth effect occurs for the No-Project Alternative in relation to 2002 existing conditions, with population and employment growth rates between 20 percent and 150 percent for nearly all counties.

The major difference between the system alternatives relates to the relative level of employment and population growth in different regions of the State. However, these relative differences are small, with a maximum county-level growth rate for the Modal and HST Alternatives (relative to the No-Project) of six percent, and most counties having a differential growth rate of less than three percent.

In spite of these general findings, HST does provide synergistic opportunities to combine with regulatory-based development strategies that could limit land consumption in many counties to well below that needed for the other system alternatives. While the HST Alternative leads to modest statewide increases in employment and population, it channels this growth into the areas where it can be managed with regulatory-style land use policies and spares the vast regions of the State that will never develop the jobs/housing balance and infrastructure to reduce sprawl and long-distance commuting.

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## **2.0 Baseline/Affected Environment**

## 2.0 Baseline/Affected Environment

### ■ 2.1 Employment and Population Patterns

Over the last 30 years, California's population has grown from 20 million to over 34 million residents, while at the same time adding over 10 million jobs. Starting with the Gold Rush in 1849, California has continuously experienced rapid population and economic growth. Distance from eastern urban areas, an abundance of natural resources, a desirable climate, and numerous other factors have contributed to California's growth into the largest state in the nation.

California's economy is one of the most diverse in the world, as shown by the data in Table 2.1. Manufacturing, wholesale and retail trade, services, and government each account for over 10 percent of total employment, and as a group have fairly consistently comprised over three-quarters of total employment over the past 30 years. However, over this timeframe, the different industry groups have experienced large differences in employment growth. Among the four major industry groups, the relative representation has changed, with a decrease in the relative magnitude of manufacturing and government jobs offset by a large increase in the relative magnitude of service-related jobs. This shift in the nature of California's employment picture mirrors national trends.

**Table 2.1 California Employment Growth by Industry**

Industry	Employment (1,000s)		Growth
	1970	2000	
Employment	9,057	19,297	113%
Farming	360	779	116%
Mining, Construction	401	1,036	159%
Manufacturing	1,595	2,036	28%
Transportation, Communications and Utilities (TCU)	486	869	79%
Trade	1,801	3,856	114%
Finance, Insurance and Real Estate (FIRE)	724	1,609	122%
Services	1,865	6,628	255%
Government	1,825	2,484	36%

Source: Woods & Poole, Inc., *The Complete Economic and Demographic Source*, 2002.

Year 2002 employment data is shown in Table 2.2. These data indicate the diversity in employment mix between different subregions within California. California's Central Valley is one of the most productive agriculture regions, making California the number one agricultural state for the last 50 years. Nearly a third of all employment in the Central Valley is in agricultural-related enterprises, with over one-fifth of total employment in the South Central Valley directly in the farming industry. The Central Valley also exceeds the state average in government jobs, while trailing other regions in manufacturing and service-related employment.

The Bay Area has long been a source of finance and high technology. Gold Rush era financiers were headquartered in San Francisco, and much of the wealth generated during that period made its way through San Francisco's financial center. The Bay Area continues to be a financial center and was one of the major locations for the Internet boom of the late 1990s. Silicon Valley has one of the largest concentrations of computer manufacturers and research and development firms in the country. Currently, the Bay Area continues to lead the State in the percent of total jobs in service-related sectors, while trailing other regions in government-related employment.

Los Angeles is the second largest metropolitan area in the U.S., behind New York. Home to over 15 million residents, the Southern California region, which includes the Los Angeles and San Diego metropolitan areas, has developed from an agricultural and resort-based economy to a diverse economy, including the major location for the motion picture industry, defense contracting, and services.

Overall, California's economy like the nation's has become less focused on production of goods and more focused on services, entertainment, and trade. These trends hold when one looks beyond employment numbers to the contribution of different industry groups to the overall size of the economy, as shown in Table 2.3. Three service sector industries – business, social, and legal – are among the 10 fastest growing industries in California, with business services' contribution to gross state product (GSP) growing by 1,400 percent since 1977. The overall services sector grew by over 800 percent. The services and FIRE sectors accounted for nearly one-half of the growth in GSP since 1977, with the combined contribution of these groups growing from 33 to 46 percent of the total economy in California.

As of 2002, California was estimated to have about 35.8 million residents and 19.8 million jobs. Table 2.4 displays county-level population and employment totals for the counties that were included in one of the REMI analysis regions; all other counties in the State were included in the "rest of state" grouping (see Section 3.0). This table also displays an estimate of current urbanization magnitudes in each county for 2002. As expected, the inner Bay Area Counties, as well as Orange, Los Angeles, and Sacramento Counties, have the highest current levels so urbanization, with most other counties in the State having less than 10 percent of land at urbanized densities. All of these values serve as baseline estimates for the analysis of economic growth effects.

**Table 2.2. Year 2002 Baseline Employment by Industrial Group**

Industrial Group	REMI Region												Statewide Total	
	Bay Area*		North Central Valley*		South Central Valley*		Southern California*		Rest of State					
	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total	Employment	% of Total		
Farming	56,369	1%	113,890	8%	198,871	20%	181,529	2%	246,365	9%	797,024	4%		
Mining	5,498	0%	1,102	0%	10,300	1%	13,872	0%	6,096	0%	36,868	0%		
Construction	207,381	5%	82,602	5%	48,168	5%	509,896	5%	171,131	6%	1,019,178	5%		
Manufacturing	466,939	11%	115,567	8%	58,378	6%	1,189,393	11%	215,459	8%	2,045,736	10%		
TCU	212,668	5%	65,944	4%	38,514	4%	486,846	5%	88,512	3%	892,484	5%		
Wholesale	201,277	5%	58,005	4%	33,694	3%	565,802	5%	136,204	5%	994,982	5%		
Retail	588,730	14%	230,680	15%	141,962	14%	1,557,347	15%	406,082	15%	2,924,801	15%		
FIRE	357,709	9%	118,311	8%	57,590	6%	890,477	9%	214,575	8%	1,638,662	8%		
Services	1,573,671	38%	423,612	28%	230,962	23%	3,798,612	36%	861,643	32%	6,888,500	35%		
Government	432,262	11%	294,634	20%	166,430	17%	1,280,179	12%	376,152	14%	2,549,657	13%		
Total	4,102,504		1,504,347		984,869		10,473,953		2,722,219		19,787,892			

\* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "Rest of State" grouping.

Source: Woods & Poole, Inc., *The Complete Economic and Demographic Source*, 2002.

**Table 2.3 California Gross State Product, by Major Industries**

Industry	Gross State Product (\$)		Growth
	1977	2000	
Farming	6,559	24,587	275%
Mining	3,000	9,233	208%
Construction	11,246	55,472	393%
Manufacturing	41,115	189,962	362%
Transportation & utilities	18,081	94,183	421%
Wholesale trade	16,395	87,392	433%
Retail trade	24,088	121,300	404%
F.I.R.E.	39,329	293,110	645%
Services	35,657	328,274	821%
Government	33,998	141,109	315%
<b>Total</b>	<b>229,468</b>	<b>1,344,623</b>	<b>486%</b>

Source: U.S. Bureau of Economic Analysis.

**Table 2.4 Year 2002 Population, Employment, and Urbanized Densities**

County	Population	Employment	Acreage of Land at Urbanized Densities for Employment and/or Population	Percent of Land Area at Urbanized Densities
Alameda	1,513,356	899,901	141,654	30%
Contra Costa	953,069	483,812	142,467	31%
San Francisco	795,577	771,599	23,277	78%
San Mateo	770,102	501,712	70,869	25%
Santa Clara	1,826,362	1,281,313	184,481	22%
Solano	416,292	164,167	53,757	10%
Bay Area*	6,274,758	4,102,504	616,505	24%
Madera	135,695	59,123	23,255	2%
Merced	224,709	90,070	31,712	3%
Sacramento	1,259,423	756,313	157,101	25%
San Joaquin	607,331	268,325	74,250	8%
Stanislaus	485,123	216,690	55,426	6%
Yolo	170,518	113,826	26,342	4%
North Central Valley*	2,882,799	1,504,347	368,086	6%
Fresno	839,582	429,002	96,977	3%
Kern	712,198	322,774	111,468	2%
Kings	132,092	51,289	29,479	3%
Tulare	397,616	181,804	48,656	2%

**Table 2.4 Year 2002 Population, Employment, and Urbanized Densities  
(continued)**

County	Population	Employment	Acreage of Land at Urbanized Densities for Employment and/or Population	Percent of Land Area at Urbanized Densities
South Central Valley*	2,081,488	984,869	286,580	2%
Los Angeles	10,007,779	5,452,745	763,373	29%
Orange	2,910,976	1,878,327	273,713	54%
Riverside	1,681,186	656,839	255,230	6%
San Bernardino	1,816,378	731,420	237,905	2%
San Diego	3,066,423	1,754,622	340,837	13%
Southern California*	19,482,742	10,473,953	1,871,058	8%
Rest of State	5,080,451	2,722,219	3,142,229	6%
Statewide Total	35,802,238	19,787,892	6,284,458	6%

\* Only includes counties within a region that have a high-speed rail station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in the “rest of state” grouping.

Sources: California Department of Finance (population data); Woods & Poole Economics, Inc. (employment); Cambridge Systematics, Inc. (urbanized acres); and U.S. Bureau of the Census (urbanization percentage).

## ■ 2.2 Alternatives Considered

This economic growth analysis considered the three system alternatives developed for the Program-Level Environmental Impact Report (EIR) and Tier 1 Environmental Impact Statement (EIS). These system alternatives included No-Project, Modal, and High-Speed Train (HST). The physical features of each alternative as described in the *System Alternatives Definition*<sup>1</sup> report were followed in preparing the growth analysis. Therefore, the following descriptions of the three alternatives focus on the characteristics that most influence the growth analysis, including key assumptions regarding operational features.

### 2.2.1 No-Project Alternative

The No-Project Alternative describes the State’s transportation system that serves the same intercity travel market as the other alternatives. It describes the highway, air,

<sup>1</sup> *System Alternatives Definition – Deliberative Draft*; California High-Speed Rail Authority; November 18, 2002

conventional rail, and bus facilities and operation that existed in 1999-2000; and as they will be after improvements that have been approved and funded in the fiscally constrained and conforming regional and State Transportation Improvement Programs (RTPs, STIP) and Airport Development Programs (ADPs) are in place. This alternative is depicted in Figure 2.1. The *System Alternatives Definition* report describes general physical features of the No-Project Alternative in the year 2020.

Transportation demand and service levels (i.e., travel time and cost) for each mode were also needed to analyze economic growth effects. For year 2020 transportation demand on all modes, the HSRA's intercity travel demand model was applied in a sensitivity test using the increased air and auto growth rates from *sensitivity analysis #1*,<sup>2</sup> combined with network, travel time and cost attributes from the Business Plan that represent the No-Project Alternative. It is expected that the No-Project Alternative will serve approximately 252.8 million trips in the year 2020 on all modes.

For the purposes of the economic growth analysis, year 2020 service levels for the No-Project Alternative were set equal to the values used for *sensitivity analysis #5D*, except for air fares, which were kept at the levels used in the Business Plan's *base forecast*<sup>3</sup>. *Sensitivity Analysis #5D* included higher air and auto travel times for many trips to, from, or through the Bay Area or Southern California.

Transportation demand for 2035 was estimated by applying the mode specific annual growth rates from the Business Plan (*sensitivity analysis #1*) to the year 2020 travel demand model results. Transportation service levels for the No-Project Alternative in 2035 were assumed to be identical to the year 2020 values for this alternative. This service level assumption was tied to a second assumption regarding the physical features of the No-Project Alternative in 2035. It was assumed that, beyond 2020, investments would continue to be made in California's transportation system at a level sufficient to maintain the transportation service levels that would be experienced in 2020. This assumption was followed for all system alternatives since more specific detail was not developed for the alternatives for the period beyond 2020, and any specific project assumptions would be speculative.

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<sup>2</sup> California High-Speed Rail Authority, *Final Business Plan*, June 2000, pp 29-30.

<sup>3</sup> For the economic growth analysis, airfares were maintained at the same level as were used in the HSRA's intercity travel demand model in order to match the costs that were assumed for each system alternative in the demand forecasts; this planning assumption was adopted since air demand was very sensitive to the airfares, while at the same time airfares were not sensitive air or auto congestion levels (within the intercity travel demand model). Conversely, air and auto travel times were initially set equal for all system alternatives, and then subsequently adjusted for the Modal and HST Alternatives to reflect the congestion and delay reduction that could occur with increased capacity or demand diversion to HST, respectively.

**Figure 2.1 No-Project Alternative – California Transportation System**



## 2.2.2 Modal Alternative

This Modal Alternative describes potential improvements to the highway and airport components of the statewide transportation system. A similar level of intercity travel demand served by the No-Project Alternative was allocated to the highways and airports described under the No-Project Alternative. This intercity demand was used to identify improvements or facilities expansions that could serve the demand at a similar level of capacity, regardless of funding potential and in lieu of high-speed train service. The improvements assumed for each mode are capacity oriented (e.g., additional traffic lanes for highways with associated interchange reconfiguration and ramp improvements; additional gates and runways for airports with associated taxi ways, parking, and passenger terminal facilities). The highway component of this alternative is depicted in Figure 2.2, while the aviation component is depicted in Figure 2.3. The *System Alternatives Definition* report describes general physical features of the Modal Alternative in the year 2020.

Since the Modal Alternative was not tested with the HSRA's intercity travel demand model, an indirect method was used to develop reasonable estimates of travel demand, time, and cost for the Modal Alternative based on similar information for the other alternatives. Appendix A provides a detailed description of the methods that were used to develop these estimates for the 255.4 million intercity and commute trips to be served by the Modal Alternative.

Transportation demand and service levels for 2035 were estimated in a hybrid process that used the assumptions described for the No-Project Alternative (including assumptions regarding continued investments in California's transportation system beyond 2020), and applied the adjustment processes described in Appendix A.

## 2.2.3 HST Alternative and Design Options

The Authority has defined a proposed statewide high-speed train system capable of speeds in excess of 200 miles per hour on dedicated, fully grade-separated tracks, with state-of-the-art safety, signaling, and automated train control systems. Steel-wheel on steel rail technology will be considered for the system that would serve the major metropolitan centers of California (extending from Sacramento and the San Francisco Bay Area through the Central Valley, to Los Angeles and San Diego). A specific system of corridors was defined and considered to establish the ridership forecasts. The general layout and major options of this route are depicted in Figure 2.4.

The analysis of economic growth effects considered a "base" HST Alternative and several "design options." Each of these HST systems included a unique combination of alignments and station locations; physical features of the other modes were assumed to be identical between the base HST Alternative and each design option. The key physical characteristic of each HST Alternative considered in this analysis are as follows:

Figure 2.2 Modal Alternative – Highway Component

